

WHAT IS CLAIMED IS:

1. A method of olfactory pattern classification comprising the steps of:
 - sensing odorants using a plurality of odor receptors;
 - converting output of said sensing step to binary data;
 - inputting binary data from said converting step to a spiking neural network;
 - training said spiking neural network to learn most prevalent combination of odor receptors; and
 - associating said combination of odor receptors from said training step with an output neuron.
2. The method of olfactory pattern classification of claim 1 further comprising the step of converting said binary data into spike trains comprising an adder/comparator combination having an input of zero representing a lack of odorant stimulus and an input of one representing an odorant stimulus.
3. The method of olfactory pattern classification of claim 2 wherein said training step further comprises the steps of:
 - summing active inputs to a counter for every clock cycle of said adder/comparator combination;
 - adding one to every clock cycle of said adder/comparator for every zero input;
 - posting a spike to a spike bus every time said counter reaches a specified threshold;
 - and
 - resetting said counter to zero after said posting step.
4. The method of olfactory pattern classification of claim 3 wherein said summing step further comprises summing active inputs to a counter for every 20KHz clock cycle of said adder/comparator combination.
5. The method of olfactory pattern classification of claim 1 wherein said sensing step further comprises sensing odorants using a plurality of CHEMFET odor receptors.
6. The method of olfactory pattern classification of claim 1 wherein said sensing step further comprises sensing odorants using a plurality of IONFET odor receptors.
7. The method of olfactory pattern classification of claim 1 wherein said training step further comprises the steps of:
 - receiving an input signal from an olfactory receptor;
 - summing said input from said receiving step;

adding one to a clock cycle for every input signal from said receiving step;
 comparing values from said summing step and said adding step and comparing to a
 preselected threshold value;
 inputting an above threshold value from said summing step to a spike bus;
 determining whether value from said inputting step matches data on a synapse listing;
 adding values from said determining step that do not match data on said synapse listing
 to a noise counter;
 adding values from said determining step that do match data on said synapse list to a
 spike counter; and
 outputting a signal associated with said spike counter after inputs to said spike counter
 reach a preselected threshold value.

8. The method of olfactory pattern classification of claim 7 wherein said inputting step further comprises the steps of:

providing a spike bus including synchronization logic;
 connecting input signal from said receiving step to said spike bus using a priority
 encoder;
 posting address of said input signal on said spike bus using said priority encoder; and
 connecting neuron modules in parallel to said spike bus by a potentiated synapse list.

9. The method of olfactory pattern classification of claim 7 wherein said determining step further comprises the step of determining whether value from said inputting step matches data on a synapse listing containing odor receptor signatures.

10. A method of olfactory pattern classification comprising the steps of:

sensing odorants using a plurality of odor receptors;
 first converting output of said sensing step to binary data;
 second converting said binary data into spike trains comprising an adder/comparator
 combination having an input of zero representing a lack of odorant stimulus and an
 input of one representing an odorant stimulus;
 summing active inputs to a counter for every clock cycle of said adder/comparator
 combination;
 adding one to every clock cycle of said adder/comparator for every zero input;
 posting a spike to a spike bus every time said counter reaches a specified threshold;
 resetting said counter to zero after said posting step;

training said spiking neural network to learn which combination of odor receptors is most prevelant; and
 associating a set of most prevelant orodor receptors with an output neuron.

11. An olfactory pattern classification device comprising:

- a plurality of odor receptors for sensing odorants;
- means for converting output of said odor receptors to binary data;
- a spiking neural network for receiving said binary data comprising:
 - a plurality of potentiated synapses, wherein the weight of an off synapse is zero and the weight of an on synapse is one;
 - a counter for adding positive weights from said potentiated synapses;
 - a threshold comparator for determining when said counter has reached a preselected threshold value;
- a training program for training said spiking neural network to learn which combination of odor receptors is most prevelant; and
- a specified output neuron specified by which set of odor receptors are most prevelant

12. The olfactory pattern classification device of claim 11 wherein said training program further comprises:

- a spike bus providing synchronization logic;
- a priority encoder for connecting an input signal from said spike bus and for posting address of said input signal on said spike bus; and
- a potentiated synapse list for connecting neuron modules in parallel to said spike bus.

13. The olfactory pattern classification device of claim 12 wherein said potentiated synapse list further comprises a potentiated synapse list comprising odor receptor signatures.